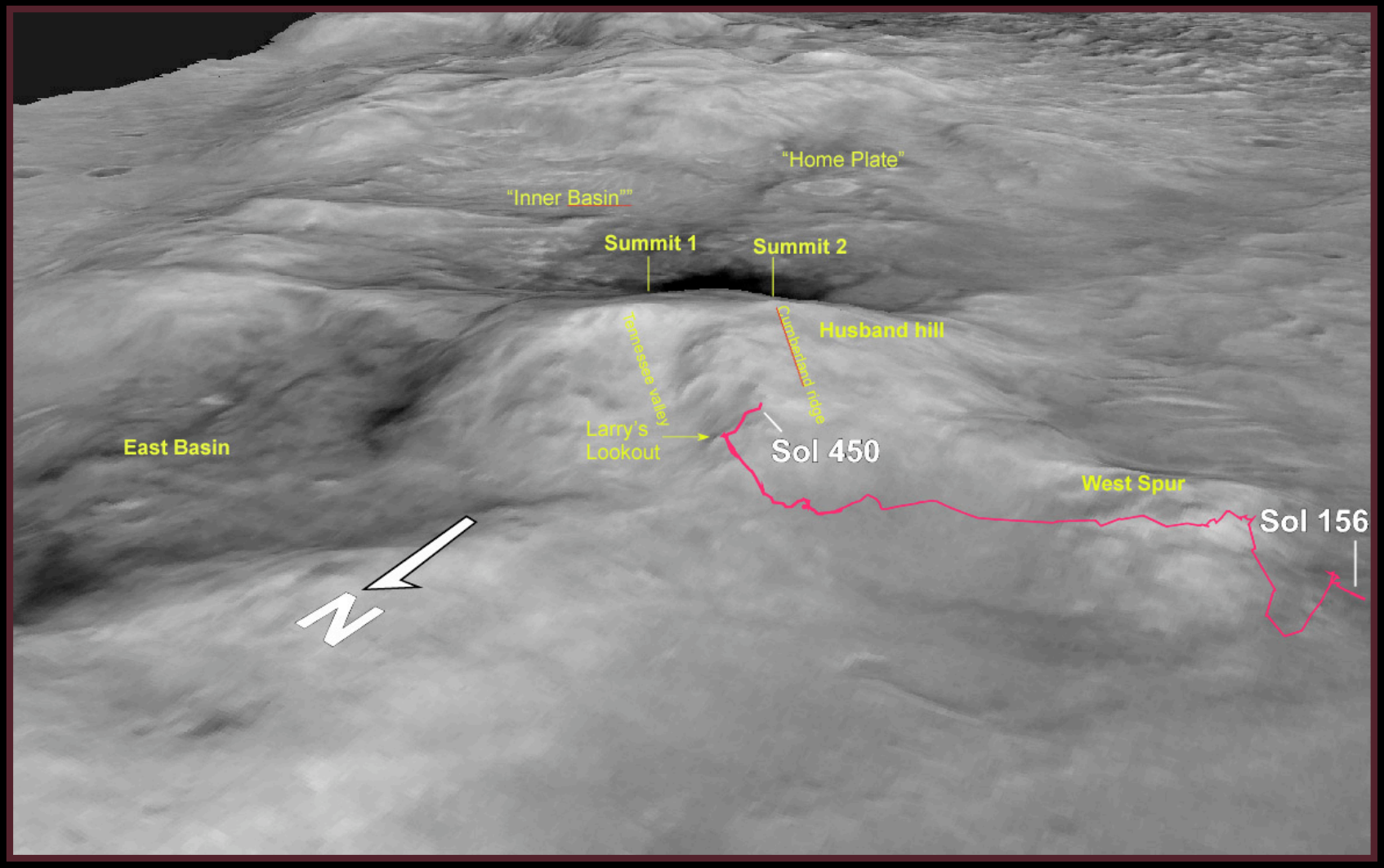
Mars Exploration Rover Mission

Spirit
and
Opportunity

Month in Review
April 1, 2005 - May 27, 2005

Spirit and Opportunity have been exploring Mars for over 15 months, and are still going strong!



Mars Orbiter Camera on Mars Global Surveyor, April 8, 2005 (sol 450).

Spirit continues to climb the steep "Columbia Hills."

Spirit paused the uphill climb so the science team could study an intriguing layered outcrop they dubbed "Methuselah."

False-color panoramic camera image, April 13, 2005 (sol 454).

Spirit spent several sols at “Larry’s Lookout.”

Navigation camera image, March 27, 2005 (sol 438).

Investigation of the science data continues to determine what force of nature (volcano, impact, or water) created this ridge.

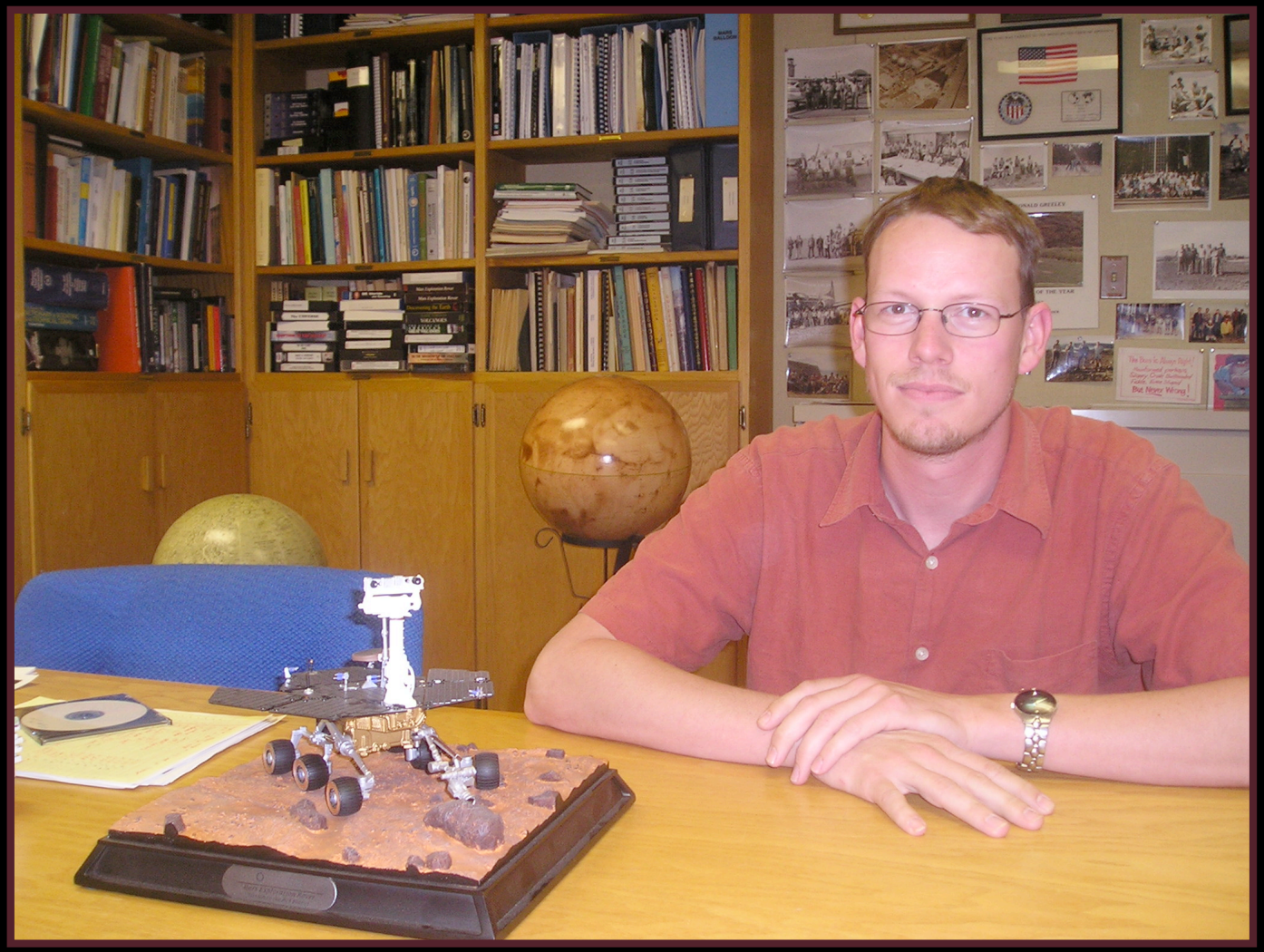
Spirit captured more ghost-like dust devils flying across the martian surface!

Navigation camera, April 15, 2005 (sol 456).

At first, the team relied on luck for cameras to capture images of dust devils, but scientists designed a new detection technique in April.

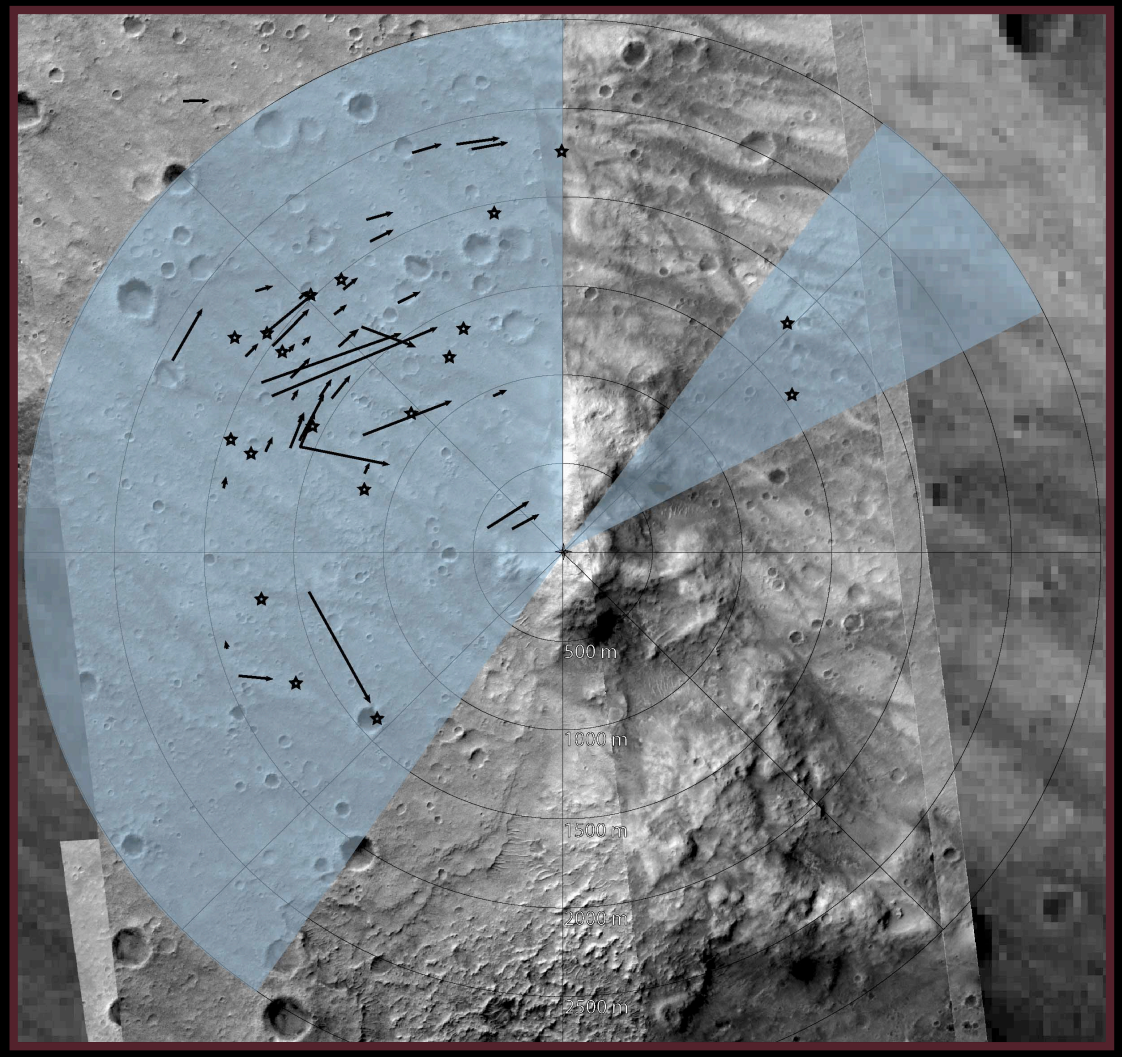
The rover now takes a series of 21 images within a few minutes.

Scientists like Shane Thompson study the images and track the locations of dust-devil sightings.



Scientist Shane Thompson by a model of the rover.

Learning about the movement patterns of small dust devils helps scientists understand more about large dust storms and how Mars became the dust-covered red planet.



Underlying image credits: Mars Orbiter Camera and THEMIS mosaic.

Orbital chart of Dust Devils
Sols 421 - 471

← = Travel Directions

* = Unknown Travel Direction

The shaded area is Spirit's viewable area as seen from the Columbia Hills out to 1.9 miles (3 kilometers).

The polar grid contains concentric circles in 0.3-mile (500-meter) intervals.

On the journey up the hills, Spirit also discovered rocks that have high sulfur content in the "Paso Robles" area.

Panoramic camera mosaic, February 27 - March 2, 2005 (sols 410 - 413).

Much of the high sulfur is contained in a hydrated iron-sulfate mineral, which can only have formed in the presence of liquid water.

Meanwhile, Opportunity entered into a new adventure with a sand dune.

Hazard-avoidance camera images of the left front and right rear wheels, May 10, 2005 (sol 460).

The rover accidentally dug itself wheel-hub-deep into a ripple about one foot (one-third of a meter) tall and 8 feet (2.5 meters) wide.

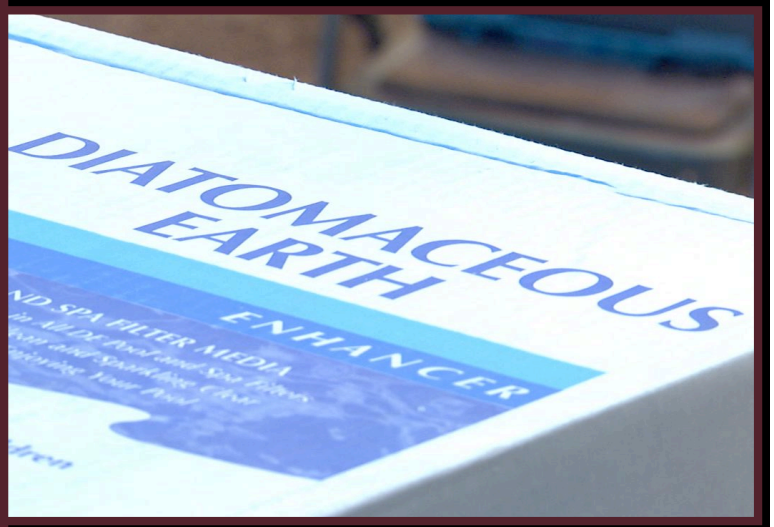
Opportunity had driven over dozens of ripples, but this one is different in that it is taller and steeper.

Overhead projection of navigation camera mosaic images, April 26, 2005 (sol 446).

Engineers cooked up a recipe to simulate the fine, loose material on Mars in JPL's rover testing facility.

The recipe includes play sand for children's sandboxes, diatomaceous earth for swimming pool filters, and mortar clay powder.

Ingredients for simulated martian sand dune.

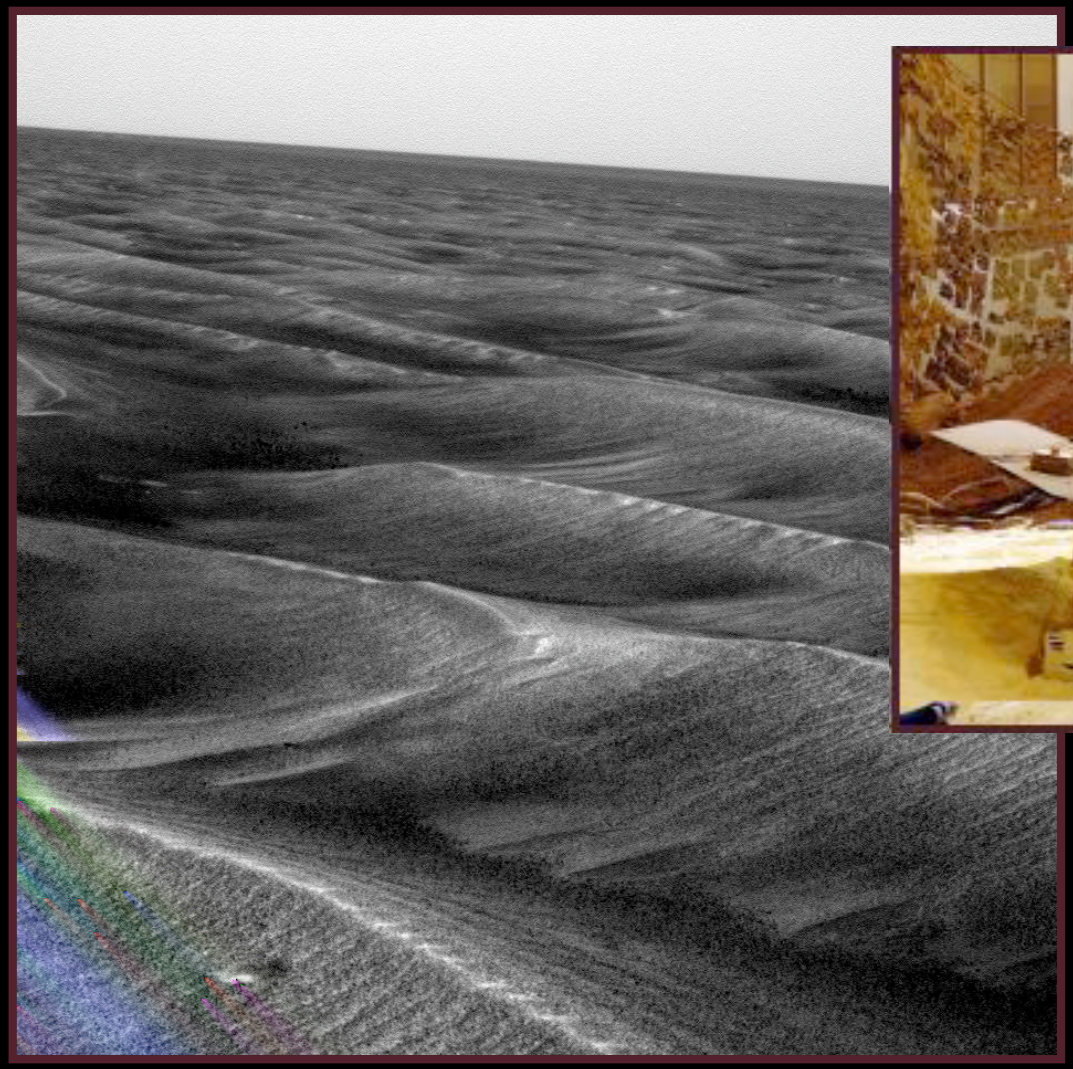


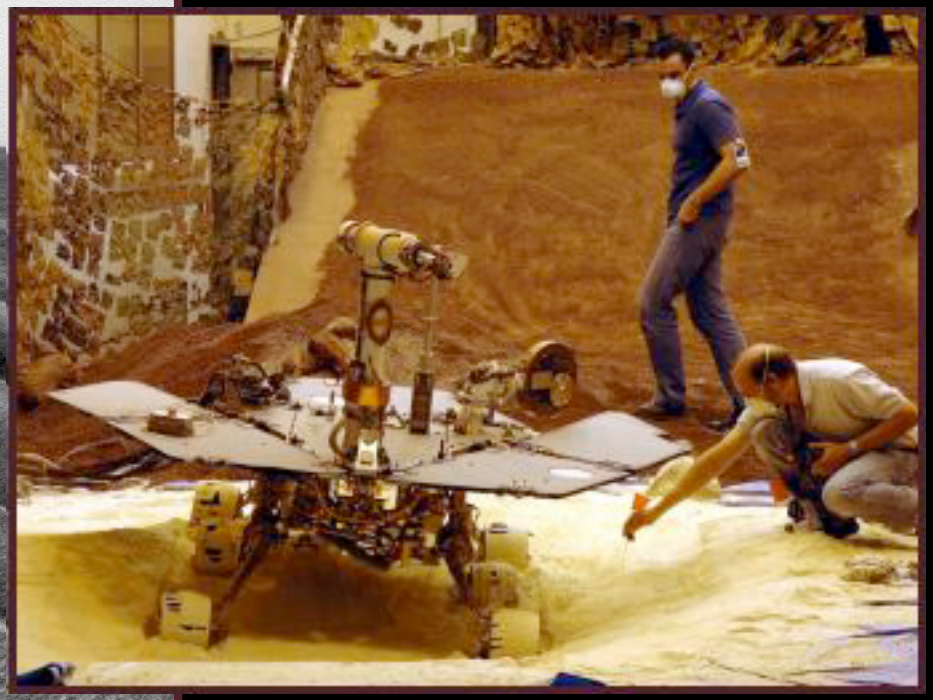
Inside the test facility at Jet Propulsion Laboratory, May 2005.

Engineers cleaned out several home supply stores to find enough bags and boxes of the ingredients to make more than 2 tons of the simulated Mars sand for realistic mobility tests.

Engineers in the Mars rover "sandbox" at the Jet Propulsion Laboratory, May 2005.

As engineers spent two weeks testing the best exit out of the dune, Opportunity continued taking Images of her surroundings.





Engineers in the Mars rover "sandbox" at the Jet Propulsion Laboratory, May 2005.

Panoramic camera image of "Rub al Khali," which means "empty quarter," May 13, 2005 (sol 463).

As of May 26, 2005, Opportunity has reversed 13 inches out of the dune.

Rear hazard-avoidance camera, May 24, 2005 (sol 474).

Without the slippage caused by the wheels spinning in the soft sand, the rover could have driven 157 feet since the initial attempts to move from the ripple.

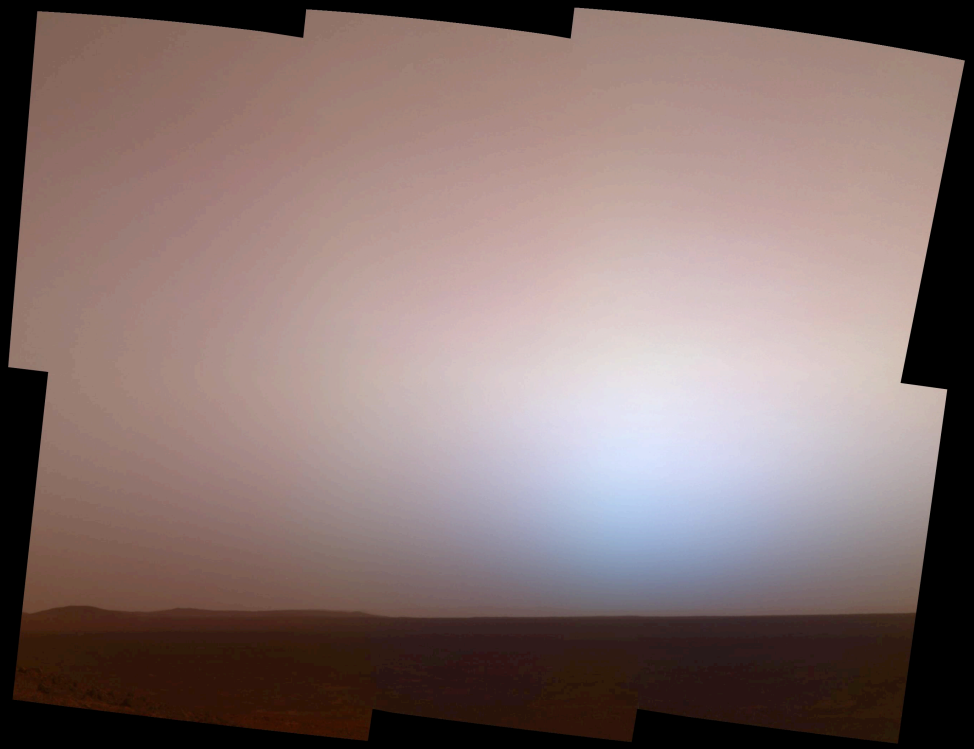
When Opportunity gets free, its next task will be examining the site to give the rover team a better understanding of how this ripple differs from dozens Opportunity easily crossed before.

Navigation camera, May 18, 2005 (sol 468).

**Before Opportunity entered the dune,
the rover took images of "Viking" and "Voyager" craters,
and the mineral-finding Mini-TES instrument
began returning good data again.**

Navigation camera image of "Viking Crater," March 31, 2005 (sol 421).

Spirit will continue atmospheric, soil, and rock studies as she climbs toward the summit of "Husband Hill."



Spirit's Panoramic camera image of the Sun setting at 6:20 Local Solar Time, April 23, 2005 (sol 464).

Opportunity will try to inch out of the dune and journey forward.